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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
COLEMAN, ERIC	
ART UNIT	PAPER NUMBER
2183	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/749,272	SODANI ET AL.	
	Examiner	Art Unit	
	Eric Coleman	2183	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3, 6,9-11, 17, 18, 21,22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merchant et al. (patent No. 6,138,838) in view of Sager et al. (patent No. 6,256,745) and Hammarlund et al. (patent No. 6,912,648).

Merchant taught the invention substantially as claimed including a data processing ("DP") system comprising (as per claims 1,9):

a) Re-scheduler (72) coupled to an instruction queue (80,81,82,83) to receive an instruction (e.g., see fig. 3 and col. 6, line 50-col. 7, line 10); and

b) Delay queue coupled to the output of the checker to hold the instruction (e.g., see fig. 3).

3. Merchant did not expressly detail (claims 1,9) that a delay unit coupled to a rescheduling unit device to store a wait history for the instruction. Sager however taught a latency vector input to a delay unit (delay line) for indicating the delay for the instruction that was determined by decoding the instruction (e.g., see col. 14,lines 50-60 and col. 13, lines 55-67). Therefore one of ordinary skill in the would have motivated to store the wait history or latency of the instruction within the rescheduler at least to

maintain the value of the latency until the instruction was delayed for the determined delay time so that the rescheduling would work properly in delaying the instruction for the determined number of cycles. It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Merchant and Sager. Both references were directed toward the problems of scheduling instructions in a DP system. And the outcome of coupling the rescheduling unit to the scheduler would have been predictable. The claimed wait history in does not perform any operation other than being stored therefore physically and operationally the data in the claim and Sager are equivalent, and the storage of the latency data is discussed above with respect to Sager. On the other Hammerlund taught the replaying of instructions where the relay depended on checkers that detected the type of instruction and error that occurred. Depending on the minimum amount of time needed to correct the error, Hammarlund taught the replay logic could store the instruction in a delay queue of the plurality of delay queue with sufficient delay period. The replay logic of Hammerlund tracked number of times the instruction was executed and that count was suggested by Hammerlund to be used in subsequent replays to better predict what delay to apply to the instruction and which delay queue to hold the instruction (e.g. see col. 14, lines 15-41). Therefore Hammerlund taught a wait history that would have been stored, at least because it was used for subsequently replays.

4. Merchant and Sager did not expressly detail (claims 1,9) that a delay queue to hold the instruction prior to the writing the instruction into a scheduler. Hammerlund

et.al. however taught a delay queue (432,434,436,438) to hold the instruction prior to writing to the scheduler(402) (e.g., see fig. 4).

5. It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Merchant and Hammerlund. Both references were directed toward the problems of scheduling instructions in a DP system. One of ordinary skill would have been motivated to incorporate Hammerlund teaching of plural delay queues to at least to facilitate implementing the different delays of instructions. Also the outcome of addition of the Hammerlund queue would have been predictable.

6. As to the further limitations of claim 9, Merchant taught a memory (122) and processor coupled to the memory and to execute the instructions and rescheduler having a first input coupled to a instruction queue(80,81,82,83,) and a second input coupled to a replay unit and an output (e.g., see fig. 3).

7. As per claims 2, 10, Hammerlund taught at least one delay line wherein each of the at least one delay line is to hold the instruction for a fixed number of clock cycles (e.g., see fig. 3 and col. 13, line 15-64).

8. As per claims 3, 11,Sager taught the re-scheduler device is to sort the instruction into at least one delay line based on the wait history of the instruction (e.g., see fig. 8 and col. 13, lines 33-67). Hammerlund also taught the sorting of an instruction to delay queues based on wait history (e.g., see col. 13, lines 15-41).

9. As per claims 17,21 Merchant taught receiving and instruction output from an instruction queue (80,81,82,83) to a checker (e.g., see fig. 3), And placing the instruction in a delay queue (85,84) (e.g., see fig. 3). Merchant did not specifically detail

the delay unit scheduling history for the instruction and determining wait time for the instruction. Sager however taught this limitation (e.g., see fig. 8 and col. 13, line 55-col. 14, line 60). It would have been obvious to one of ordinary skill to combine the teachings of Merchant and Sager. Both references were directed toward the problems of scheduling instructions in a DP system. And the outcome of coupling the rescheduling unit to the scheduler would have been predictable. On the other hand, Hammerlund taught the replaying of instructions where the relay depended on checkers that detected the type of instruction and error that occurred. Depending on the minimum amount of time needed to correct the error, Hammarlund taught the replay logic could store the instruction in a delay queue of the plurality of delay queue with sufficient delay period. The replay logic of Hammerlund tracked number of times the instruction was executed and that count was suggested by Hammerlund to be used in subsequent replays to better predict what delay to apply to the instruction and which delay queue to hold the instruction (e.g. see col. 14, lines 15-41). Therefore Hammerlund taught a wait history that was determined for an instruction and a delay unit was checked for scheduling history.

10. The incorporation of the delay unit scheduling history would provided predictable results. Merchant and Sager did not specifically detail writing the instruction to the scheduler after a fixed wait time. Hammerlund however taught this limitation (e.g., see fig. 3 and col. 13, lines 15-65). The incorporation of the writing of the instruction to a scheduler would have provided predictable results.

11. As per claims18, 22 Merchant did not expressly detail determining a wait time for the instruction is based on the scheduling history stored in the delay unit (e.g., see fig. 8). Sager however taught a latency vector input to a delay unit (delay line) for indicating the delay for the instruction that was determined by decoding the instruction (e.g., see col. 14,lines 50-60 and col. 13, lines 55-67). Therefore one of ordinary skill in the would have motivated to store the wait history or latency of the instruction within the delay unit at least to maintain the value of the latency until the instruction was delayed for the determined delay time so that the multiplexer would work properly in delaying the instruction for the determined number of cycles. And the outcome of coupling the rescheduling unit to the scheduler would have been predictable.

As per claim 6, Merchant taught storing resource conflicts for the instruction when the instruction encounters resource conflicts (e.g., see col. 4, lines 1-67).

12. Claims 4-5, and 7-8,12,13,14,15,16,19,20,23,24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merchant, Sager and Hammerlund as applied to claims 1-3,9-11,17,18, 21,22 above, and further in view of Grochowski (patent No. 6,035,389).

13. As per claim 4,5,12-13 Grochowski taught the delay unit is to store wait history or latency information for said instruction when said is first scheduled, and is to update wait history information for the instruction when the instruction is executed (e.g., see fig. 5).

14. One of ordinary skill would have been motivated to incorporate the Grochowski teachings of updating the latency or wait value at least to more accurately delay the

instructions in the scheduling of instructions that needed to be replayed. Also the incorporation of the updating of the latency would have provided predictable results.

15. As per claims 7,8,14,15,20,24 Grochowski taught the delay block utilizes a general prediction scheme to determine a number of clock cycles to store as the wait history and sorts instruction based on wait history or latency (e.g., see col. 3, lines 26-55 and col. 5, lines 8-32)[one general prediction scheme taught by Grochowski was to group instructions by type and predict that the instruction of a group have the same latency].

16. As per claims 16,19, 23, Sager taught the re-scheduler device is to sort the instruction into at least one delay line based on the wait history of the instruction (e.g., see fig. 8 and col. 13, lines 33-67). Hammerlund also taught the sorting of an instruction to delay queues based on wait history (e.g., see col. 13, lines 15-41).

17. The change in scope of the amended claims necessitated a new search.3

Response to Arguments

Applicant's arguments filed 12/31/07 have been fully considered but they are not persuasive.

In the remarks applicant argues that the "wait history" is described in one embodiment of the invention of claim 9, as "Each instruction carries information with it that specifies how long it is likely to wait in the scheduler before scheduling based on previous dispatches and executions of the instruction" (application paragraph 22, lines 1-33), and alleges that one of ordinary skill in the art would not include the latency vector of Sager in the definition of wait history. The argument is directed to disclosed,

but unclaimed definitions of wait history. However the claimed wait history merely provides for data stored in memory that is named wait history. The rejection of this limitation with respect to the scope of the claimed limitation has been clarified in the rejection above and indication of where each previously cited prior art reference meets the limitation. Sager uses latency data for providing the necessary delay for rescheduling of instructions This delay line provides a wait time during replay of an instruction therefore the data indicating the latency clearly provides wait data and since the latency data was provided due to, and corresponding to, past wait occurrences the latency data provides wait history.

Applicant argues at to claim 9 " a scheduler coupled to said rescheduler input and " a rescheduler having a second input coupled to a replay unit. Applicant argues that Hammerlund is a method for replay whereas the invention of claim 9 is for reducing the latencies in scheduling instrargues that the element 72 of Merchant does not have an input of a replay unit and one of skill in art would have a hit/miss logic to include the definition of a replay unit, and the re-scheduler of the Application as illustrated in Figure 3 of the application allegedly fails because the "rescheduler of the Application is placed before the scheduler in the instruction queue both in Figure 3 and by the limitations of claim 9 and applicant sites the language ouctions. Also the applicant alleged that the dependent claims also are not suggested for disclosed by any combination of Merchant Sager and Hammarlund. The Examiner contends that the "coupled" language in the claims allow for the claimed elements to connected via other elements that are in between. Also the element (72) accesses a scoreboard , receives a replay signal from

the execution unit and is within a replay system (70) and checks whether the an instruction to be replayed via staging elements 84,85 and also sends a replay signal to a retirement unit in figure 3. Therefore performs a rescheduling function. As to the Hammarlund argument, Hammarlund taught a system that provides a checker that sends an instruction for replay to a delay queue depending on the delay or wait required previously by the instruction and this provides a rescheduling function (e.g., see fig. 4. and col. 13, lines 15-41). This clearly has the effect of reducing delays. This is clarified in the outstanding rejection above. The dependent claims and other independent claims are rejected as detailed in the response to arguments above and the outstanding rejections above.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric Coleman whose telephone number is (571) 272-4163. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on (571) 272-4162. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EC

/Eric Coleman/
Primary Examiner, Art Unit 2183